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D5.7 – EO4GEO Sub sector Intermediate results

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Work package / Task:

WP5 - Testing and validating the strategy based on case-based learning scenario's in 3 sub-sectors

T5.6 - Feedback and lessons learned from the testing and validation

Short Description:

Report of the workshop held online on September 28th 2021. The workshop covered feedback compiled from the tasting and validation of implemented training measures in the form of achievements and challenges with recommendations for the future training actions.

Keywords:

Evaluation; training offer; Training Actions (TA); learning outcomes; Earth Observations (EO)

Dissemination Level		
PU	Public	x
RE	Restricted to other programme participants (including Commission services and project reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and project reviewers)	

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0.4	01/10/2021	Zofia Pawlak	Add-ons	Chapters 5 and 6
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1.0	04/10/2021	Zofia Pawlak	Ready for QA	First complete version
2.0	04/11/2021	Zofia Pawlak	Final version	Final version with integration of comments and suggestions by QA reviewers

Executive Summary

The EO4GEO Subsector intermediate results workshop was held online (on Zoom platform) on September 28th 2021, 11:00-13:00 CEST and was organized by UNEP/GRID-Warsaw Centre supported by Spatial Services. In total, 53 people attended the event.

The workshop focused on feedback and validation of implemented training actions developed within the EO4GEO project up to workshop's day. It covered realized events with recommendations for the future training actions. Participants learned more about the EO4GEO project and its progress, and took an active part in discussing the lessons learned from previous events and formulating recommendations for future training actions.

Significant part of the workshop covered the topic of difficulties regarding the remote form of TAs, made necessary by the COVID-19 pandemic. Even if the virtual form worked well for the students, the social component of such activities was noticeably missing. Due to pandemic, it was difficult to create an environment that could enable and enhance an effective skill transfer.

Ideas and suggestions developed during the event's groupwork and discussion part were a valuable source of information to help defining the Long-term Action Plan.

Based on the evaluation of the workshop, in general participants were satisfied with the event.

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Acronyms

Acronym	Description
AI4EO	Artificial Intelligence for Earth Observation
BoK	Body of Knowledge
EACEA	Education, Audio-visual, Culture Executive Agency
EO	Earth Observation (incl. Meteorology)
EO*GI	EO and GI sectors
EU	European Union
GI	Geographic Information
GIB	Geografiska Informationsbyrån AB
ICT	Information Computer Technology
MOOC	Massive Open Online Course
PLUS	Paris Lodron University of Salzburg
UHI	Urban Heat Island
UNIBAS	University of Basilicata

Glossary

- **Body of Knowledge (BoK)** is the complete set of concepts and relations between them, that make up a professional domain, (in this case EO*GI BoK) and the related learning outcomes as defined by the relevant learned society or a professional association.

- **Earth Observation (EO) related services** is any geo-spatial information service activity which in some way involves data coming from EO satellites (including meteorological satellites) i.e. any satellite with one or more sensors that measure parameters coming from the earth's surface or atmosphere. The involvement may be direct i.e. processing or distributing imagery or indirect i.e. consultancy based around knowledge of the imagery or its use. It starts from the point where imagery is transmitted to the ground, so it does include reception and processing of imagery but does not include construction of ground stations or the satellites delivering the data. Note that it includes all geo-spatial information services activities where satellite EO data has been used and so extends to downstream information processing of geospatial information where data being used has been derived from EO imagery possibly in combination with other data types.

- **Geographic Information (GI)** is the data of a geographic location combined with non-spatial information (e.g. statistical data) and their representation as a map.

- **Information and communication technologies (ICT)** are the infrastructure and components that enable modern computing.

- A **Course** is a unit of teaching, a set of lectures or a plan of study on a particular subject, usually leading to an exam or qualification. This unit can be used for teaching theoretical as well as practical content; depending on the specific subject of the course and its theoretical or practical nature the assessment of learners is done with an exam or through the assessment of assignments.

- **Knowledge** means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.

- **Learning** is the process by which an individual assimilates information, ideas and values and thus acquires knowledge, know-how, skills and/or competences. (Source: Cedefop, 2008) Learning occurs through teaching (from a perspective of teacher, facilitator) / learning

(from perspective of learner, trainee) activities such as reading, reflecting, practising, networking, discussing, problem solving etc. It may take place in formal (in an organised and structured environment), non-formal (embedded in planned activities not explicitly designated as learning) or informal.

- **Massive Open Online Courses (MOOC)** are free online courses reaching a large public that are provided in an affordable and flexible way to learn new skills, advance your career and deliver quality educational experiences at scale.

- **Skill** means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive or practical skills.

- **Training** is the organized activity aimed at transmitting and receiving information and/or instructions to improve the recipient's (learner, trainee) knowledge and/or skill. Methods of imparting training are, for example, on-the-job training (development through performance), case-based methods (analysis of an actual situation), knowledge-based methods.

1. Introduction

1.1. EO4GEO project

EO4GEO is an **Erasmus+ Sector Skills Alliance** gathering **25 partners from 13 EU countries**, most of which are part of the **Copernicus Academy Network**. Be they from academia, public or private sector, they are all active in the education and training fields of the space geoinformation sector. The project is also supported by a strong group of Associated Partners mostly consisting of associations or networks active in space geoinformation domain. The project started on January 1st, 2018, upon approval by the EU Education, Audiovisual and Culture Executive Agency (EACEA) and runs over four and a half years.

EO4GEO **aims to help bridging the skills gap in the space geoinformation sector** by creating a strong alliance of players from the sector/community reinforcing the existing ecosystem and **fostering the uptake and integration of space geoinformation data and services**. EO4GEO works in a **multi- and interdisciplinary** way and applies innovative solutions for its education and training actions including: case-based and collaborative learning scenarios; learning-while-doing in a living lab environment; on-the-job training; co-creation of knowledge, skills and competencies; etc.

EO4GEO defines a long-term and sustainable strategy to fill the gap between supply of and demand for space geoinformation education and training taking into account the current and expected technological and non-technological developments in the space geoinformation and related sectors (e.g. ICT). The strategy is being implemented by: creating and maintaining an ontology-based Body of Knowledge for the space geoinformation sector based on previous efforts; developing and integrating a dynamic collaborative platform with associated tools; designing and developing a series of curricula and a rich portfolio of training modules directly usable in the context of Copernicus and other relevant programmes and conducting a series of training actions for a selected set of scenario's in three sub-sectors - integrated applications, smart cities and climate change to test and validate the approach. Finally a Long-term Action Plan is being developed and endorsed to roll-out and sustain the proposed solutions

For more information on the project please visit http://www.eo4geo.eu/about-eo4geo/.

1.2. Objectives of the work package

The scope of Work Package 5 is testing and validating the (EO4GEO) strategy based on case-based learning scenarios in three sub sectors. The three sub sectors are: “Integrated Applications”, “Smart Cities” and “Climate Change”.

The work package specifies curricula based on case-based scenarios for the sub-sectors, and tests and validates them in concrete training actions. These training actions included on-the-job training like webinars and workshops but also (academic) courses and summer schools. In this context remote sensing and related techniques were considered as supporting horizontal competencies needed for conducting the case-based scenarios. The training actions were prepared in detail by mixed task forces. Each training action is complete in terms of learning objectives and content and thus is independent. This assures that in a single training action a complete lesson is learnt, and well-defined learning outcomes are achieved. Nonetheless, the different training actions are part of learning paths that link them to related training actions. Trainees can choose a learning path that guides them through training actions that are relevant for their interests.

The space geoinformation sector and the education/training providers worked closely together to prepare, conduct, and evaluate the training actions. Testing and validation were performed by involving the education/training providers, the space/geospatial industry and public sector players, the end-users of the Alliance and other relevant stakeholders.

Case-based learning

Case-based learning starts from ‘real-world’ problems or scenarios, rather than from the ‘solutions’ or supporting technologies. Training action participants learn to analyse a problem, explore how GI and EO techniques can be used for a solution and more particularly how Copernicus data and information can help in the particular case. This approach allows to demonstrate how to support different users and different types of usage. The selection, acquisition, and preparation of the GI and EO data, their (pre)processing and integration, and their transformation into information readily usable for problem-solving are important parts of the teaching/learning process.

1.3. Objectives of the task

The task on feedback and lessons learned from the testing and validation covers two main objectives:

1) Test and validate implemented Training Actions,
2) Provide the necessary input to help defining the Long-term Action Plan.

The testing and validation was performed by involving the education/training providers, the space geoinformation industry and public sector players, the end-users of the Alliance and other relevant stakeholders. It outlined achievements and challenges of the EO4GEO approach.

In order to assess the testing and validation phase even more effectively, the organization of two summer schools (in 2021) provided a comprehensive training, including group work to test and validate the usability and reusability of the curricula and training materials in other settings.

The task on feedback and lessons learned from the testing and validation consisted of the following activities:

- Accompany and advise the design and implementation of the training actions in the three sub-sectors with the objective to ascertain the impact of EO4GEO in regard to the sector skills strategy;
- Evaluate effectiveness and efficiency of the actions;
- Assess the impact, the relevance and the sustainability of the actions;
- Design and organize (joint effort of the consortium) two Summer Schools linking sub-sector scenarios to further explore cross-fertilization between space and geospatial applications to address skills gaps;
- Compile extensive feedback for the definition of the Long-term Action Plan.

1.4. Purpose of the document

The purpose of the document is to describe the results of the workshop held online on **September 28th 2021**. It covered feedback compiled from the testing and validation of implemented training measures in the form of achievements and challenges with recommendations for the future training actions.

1.5. Structure of the document

This report consists of six chapters. The main **introduction** part (chapter 1) is followed by **workshop introduction** (chapter 2), which describes main objectives of the event and methodology behind its structure. The third chapter provides an overview of the **course of events**, whereas chapter 4 covers **main messages** developed during the workshop and is followed by **event evaluation** (chapter 5). The last part of the report (chapter 6) are **conclusions** based on course of event, main messages and evaluation.

The report includes **appendixes**: event agenda, workshop notes, evaluation questionnaire.

2. Workshop introduction

The EO4GEO Subsector intermediate results workshop focused on feedback and validation of implemented training actions developed within the EO4GEO project up to workshop's day. It covered realized events with recommendations for the future training actions. Participants learned more about the EO4GEO project and its progress, and took an active part in discussing lessons learned from previous events.

The workshop was held online (on Zoom platform) on September 28th 2021, 11:00-13:00 CEST and was organized by UNEP/GRID-Warsaw Centre supported by Spatial Services. In total, 53 people attended the event.

Workshop pursued the following objectives:

1. Present to the participants the current progress of "Testing and validating the strategy based on case-based learning scenario's in 3 sub-sectors" work package;
2. Provide participants with an update on the status of the evaluation of training actions and its results;
3. Formulate recommendations for future training actions.

2.1. Methodology

The EO4GEO Subsector intermediate results workshop was composed of three main parts, to achieve event's objectives:

1. **Introduction** on EO4GEO and the Training Actions, to ensure that all participants have a basic understanding of the project, developed tools and training approach;
2. **Presentations** on selected training actions from subsectors - what have we done and achieved so far? What are the outcomes? What lessons have we learned?;
3. **Breakout session** on lessons learned from the previous events, encouraging participants to share their thoughts on improvements for future events.

3. Course of events

3.1. Introduction

The workshop was opened by Zofia Pawlak (UNEP/GRID-Warsaw Centre) with an introduction on EO4GEO and the Training Actions. After a brief and general introduction of the EO4GEO project and tools that were developed in its course, Zofia presented the project's training approach, including its general design, learning paths and rationale for the selection of scenarios. Also, past events and the planned ones were briefly presented.

At the end of the introduction part, a warm-up pool for participants was conducted via Slido, to better understand participants reasons to join the workshop, as well as prompting them to reflect on potential difficulties in webinar and workshop preparations. The results were as follow (in order of the most votes):

1. What motivated you to participate in the workshop?
    a. I'm one of the EO4GEO partner/event coordinator (**83%)**
    b. I'm not involved in the project, but I'm interested in its progress (14%)
    c. I was a participant in previous events by EO4GEO project (3%)

2. What do you think is the most problematic and mistake-prone sector in webinar and workshop preparations?
    a. Impact of the training action: meeting the expectations (**61%)**
    b. Task's practical aspects: level of difficulty, provided tools and time (21%)
    c. Organizational aspects (11%)
    d. Training content and structure (7%)

3.2. Presentations

3.2.1. Integrated Applications

Following the introduction, presentation part started. Speakers covered selected realized events with challenges and lessons learned.

The first speaker was Daniela Iasillo, from Planetek Italia, presenting "The rise of Artificial Intelligence for Earth Observation" webinar from Integrated Applications subsector. The presentation started with rationale for choosing the training action's topic and details, such as information on number of participants (250 attendees from 550 subscribers) and the webinar's agenda.

Figure 1 Slide from presentation on "The rise of Artificial Intelligence for Earth Observation" webinar by Daniela Iasillo

After a short introduction, Daniela introduced first AI4EO “Air Quality & Health” Challenge, which was announced during webinar. The challenge aimed to bring the worlds of Artificial Intelligence and Earth Observation closer together, stimulating and fostering new interaction and collaboration along the way. As webinar’s follow-up Daniela mentioned an "Intelligent Earth Observation" summer school in which organisation they participated and “AI for Earth monitoring MOOC”.

3.2.2. Summer Schools

Following, both summer schools were presented. First, Eva-Maria Missoni-Steinbacher from PLUS spoke about "Intelligent Earth Observation" summer school. Eva started her presentation with the summer school’s framework, basic information and structure.

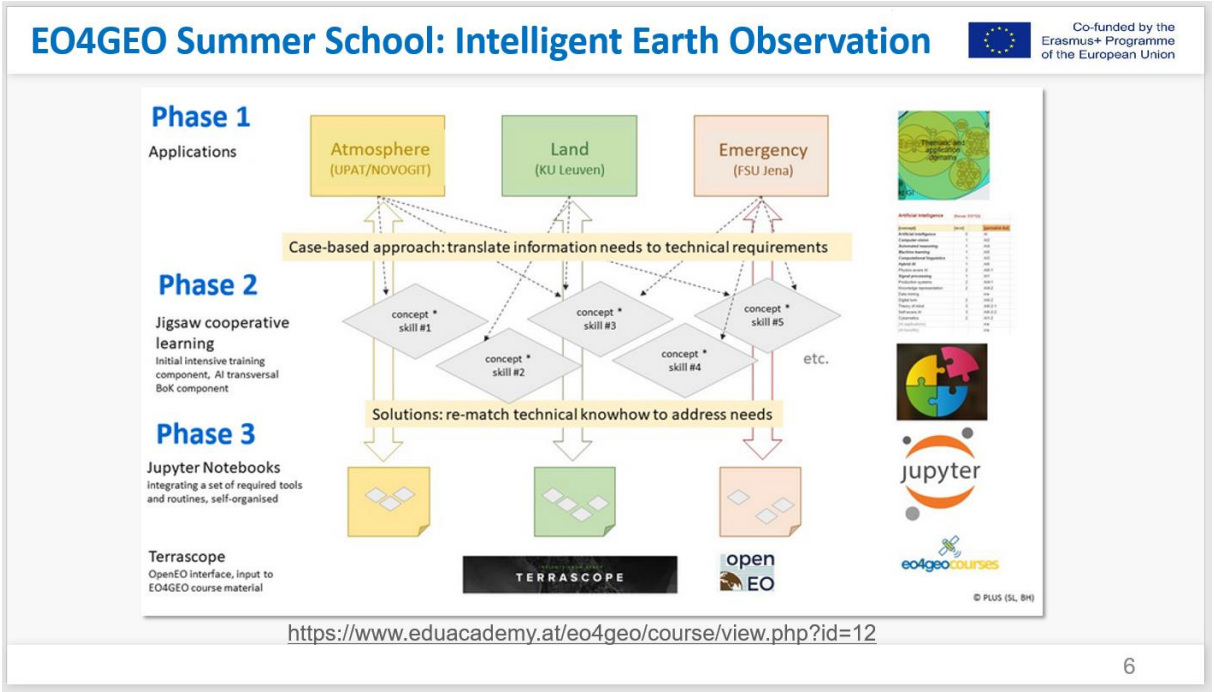

Figure 2 Slide with summer school's structure from presentation on "Intelligent Earth Observation" summer school by Eva-Maria Missoni-Steinbacher

Second part of Eva's presentation focused on event evaluation, which was divided into three steps:

1. **Evaluation forms** on expectations regarding the summer school, in which it was found that the event exceeded expectations about acquiring new skills, but not met them for all participants on conceptual inputs vs previous knowledge.

   In step 1 the **assessment of learning outcomes** was also monitored, with open questions based on summer school's material. Most participants answered them, but the level of detail varied considerably.

2. **Qualitative feedback** in which participants put their feedback and suggestion on an interactive Miro whiteboard (Figure 3). The answers were very diverse, but mainly referred to teamwork, Terrascope and the shortage of social interactions (due to an online form of the TA).

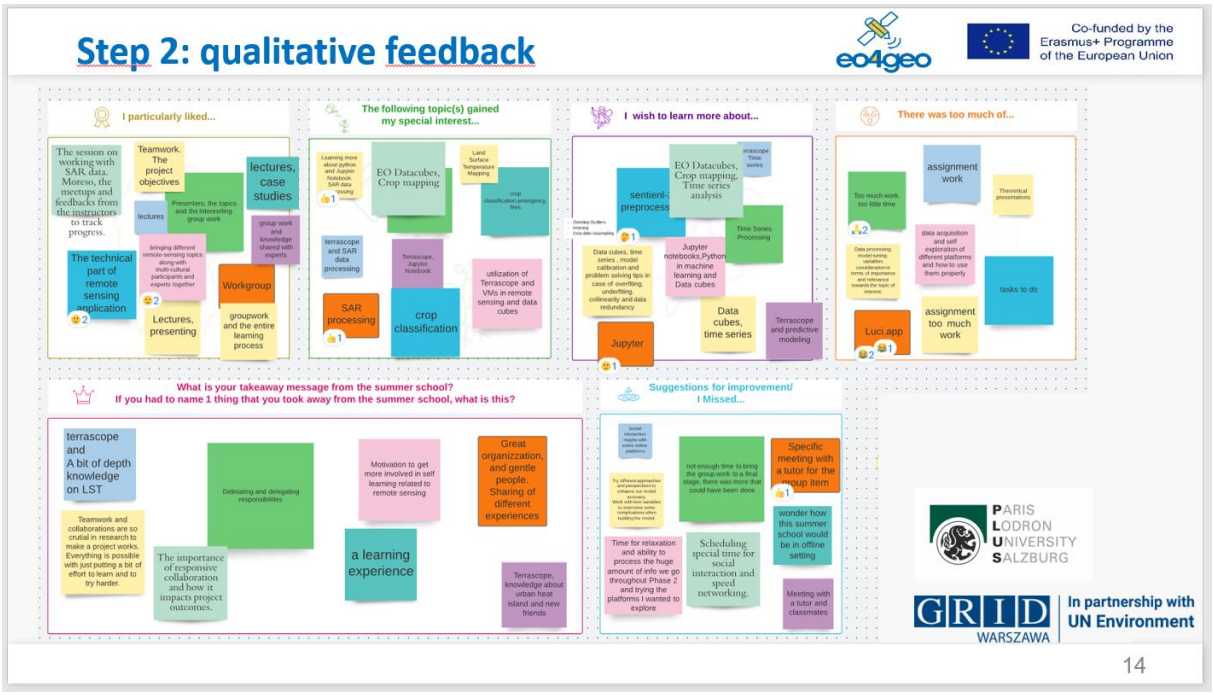

Figure 3 Slide with qualitative feedback from presentation on "Intelligent Earth Observation" summer school by Eva-Maria Missoni-Steinbacher

3. **Standardized EO4GEO Training Action Evaluation Form**, from which it became clear that the most problematic aspect was adjusting the time needed to complete the practical tasks.

In the lessons learned part Eva described how the virtual setting for their summer school worked well, although the social component was mentioned as missing. Among the improvements suggested by participants was a wish for more contact with tutors and less ambitious topics during groupwork.

Another summer school - “Introduction to Satellite Remote Sensing” - was presented by Valerio Tramutoli from UNIBAS, who started his presentations by describing the current situation regarding education and training in the EO sector in Europe, particularly within Local Public Administrations which remain among the most important potential user of EO applications. Next, the summer school training framework was presented (Figure 4) as well as the faced challenges (Figure 5) with implemented solutions (Figure 6).

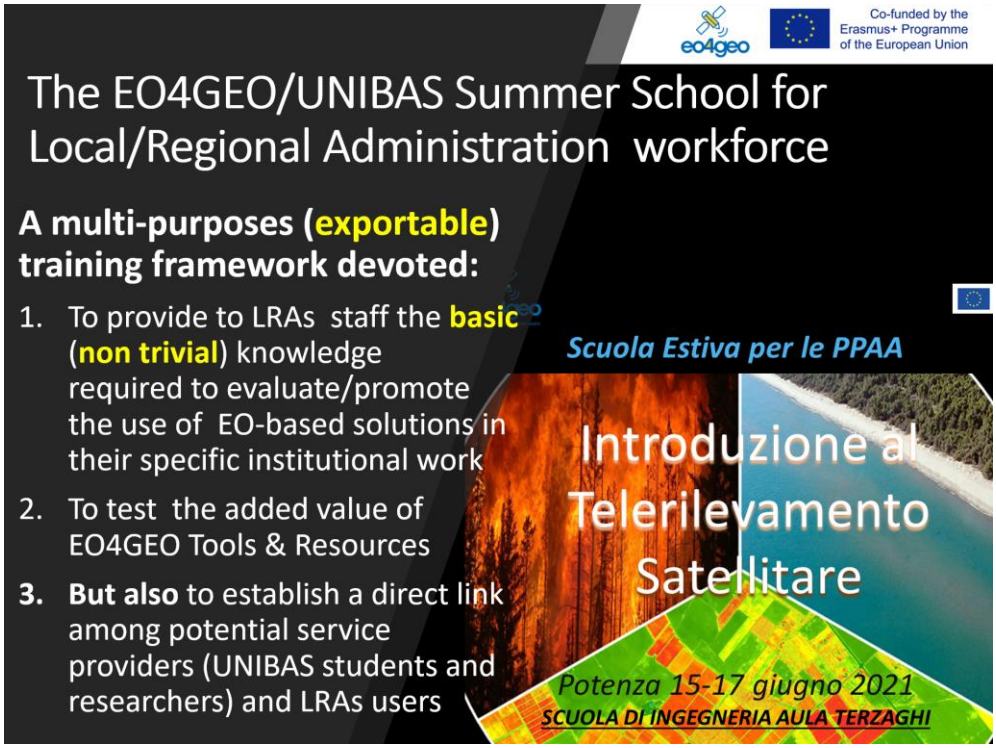

Figure 4 Slide with summer's school training framework from presentation on "Introduction to Satellite Remote Sensing" by Valerio Tramutoli

The main challenges described by Valerio were focusing on availability of target group, their background and pandemic period, which caused difficulties with the form of the event. The organizer's goal was to choose content of the training action and learning methods in a way that will increase motivation, while avoiding a purely informative effort.

Figure 5 Slide with main challenges from presentation on "Introduction to Satellite Remote Sensing" summer school by Valerio Tramutoli

To face those challenges, the summer's school organizers decided to avoid a public call for the event. Participants selection was made through the Local Administrations' Directors, with the idea of training as an investment. The summer school was a 3,5 days course offered in mixed form – in presence and remotely.

Figure 6 Slide with main choices from presentation on "Introduction to Satellite Remote Sensing" summer school by Valerio Tramutoli

After presenting the main challenges and solutions, Valerio moved to the summer's school content and usage of EO4GEO tools and selected training actions. The EO4GEO Body of Knowledge was heavily used, while organization of content was designed with the Curriculum Design Tool. Regarding summer school details, there were 21 participants, all from relevant Local Regional Administrations with quite advanced backgrounds.

At the end of his presentation, Valerio described the course quality evaluation (Figure 7) and lessons learned. The average degree of satisfaction was 4.8/5, participants recognized and appreciated an innovative approach, the intensive structuring of the course and the case-based learning method.

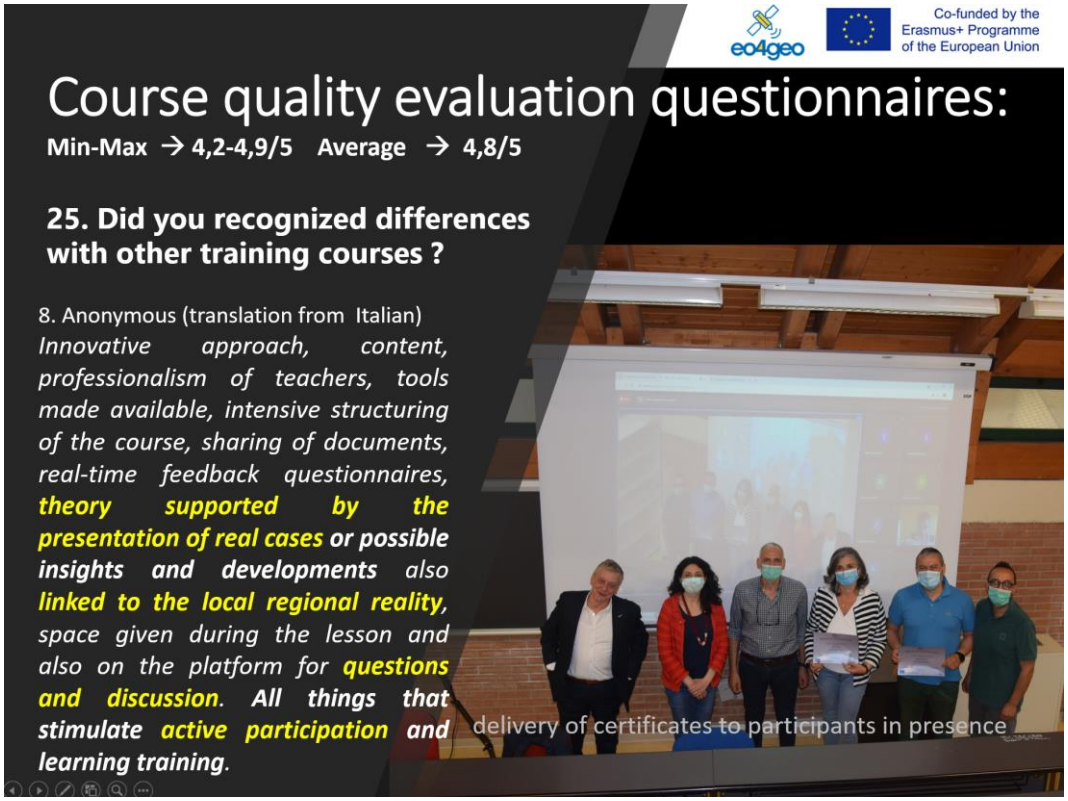

Figure 7 Slide with course quality evaluation from presentation on "Introduction to Satellite Remote Sensing" summer school by Valerio Tramutoli

In case of lessons learned, Valerio pointed to the high educational background of administration's decision makers, and the importance of giving them as much information about the Copernicus solutions as possible. So they can understand not only the possibilities, but also the complexity, limitations and potential. The main challenges for the long-term action plan highlighted by Valerio were moving to schools from virtual mode to physical mode at the end of the pandemic, and implementing new EO4GEO proposed curricula.

3.2.3. Smart Cities

The next subsector was represented by Greger Lindeberg, from GIB, who shared his experience with Smart Cities subsector webinars: "Identification of local heat islands to support city planning" and "Evaluation and planning of urban green structures".

Greger started with an overview of training actions conducted so far: "Identification of local heat islands to support city planning" webinar (February 21st 2021) and "Evaluation and planning of urban green structures" (June and September 21st 2021), and those coming in the future: "Smart cities, UHI (Urban Heat Island) and urban green" webinar and workshop (October 21st 2021) and

"Improving sustainability of cities to storm and water" project work (October – November 2021). After this short introduction, he listed the prerequisites of the cased based approach for Training Actions (Figure 8).

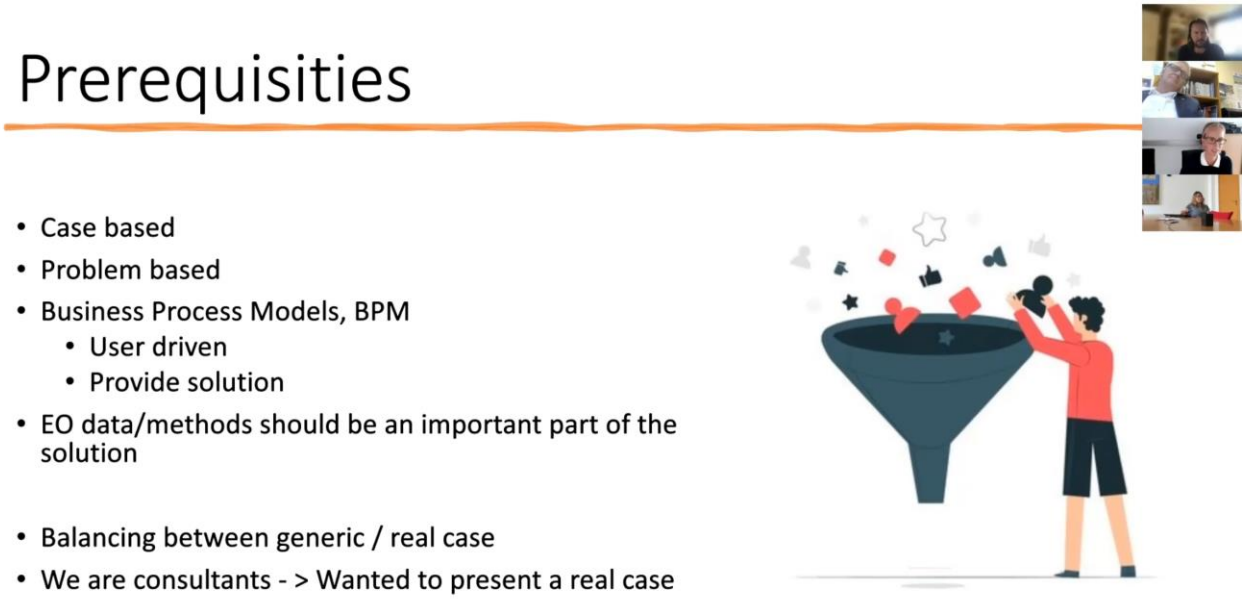

Figure 8 Slide with prerequisites of the case-based approach from presentation on Smart Cities subsector webinars by Greger Lindeberg

For the lessons learned, Greger highlighted, that it is very good that so much generic training is available within the EO4GEO project. However, more case-based material should be compiled in addition to the material already developed under EO4GEO. Also, he pointed out that devoting sufficient time to the discussion is very important, to have an opportunity for valuable interactions between speakers and participants. He also pointed that using surveys at an event can be a valuable source of information for the speakers to get to know the audience better. Greger shared exemplary poll results from one of the events (Figure 9).

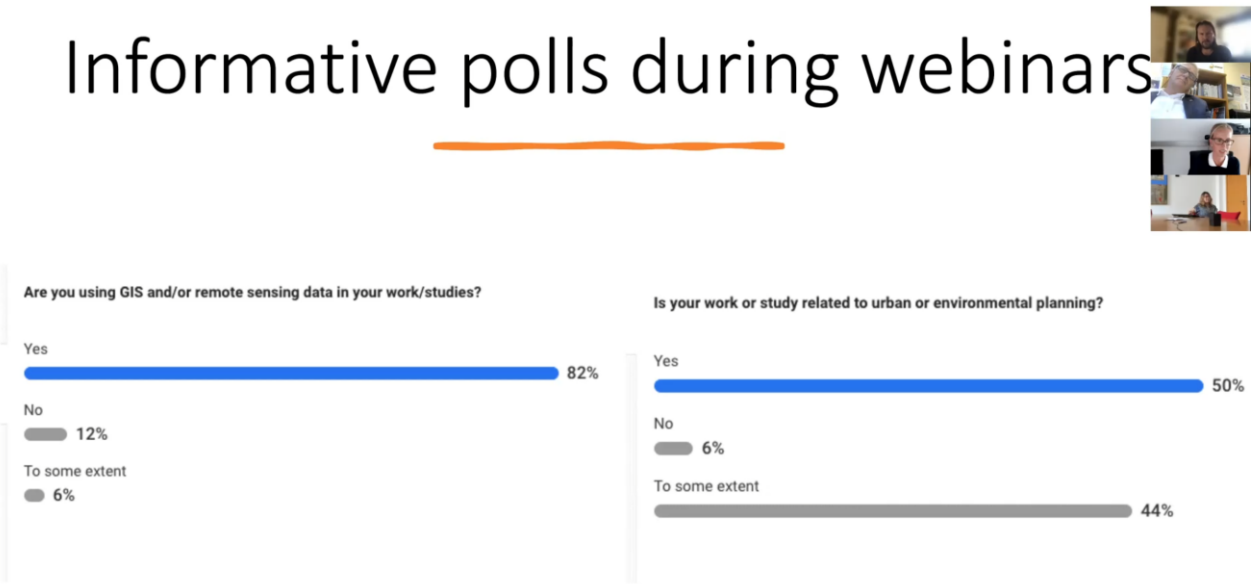

Figure 9 Slide with poll results from presentation on Smart Cities subsector webinars by Greger Lindeberg

3.2.4. Climate Change

The last speaker for this event was Zbigniew Szkop from UNEP/GRID–Warsaw Centre, on "EO for urban greenery management" webinar from Climate change subsector in April 2021. Zbigniew started his presentations by describing steps that were needed for the webinar's preparation. Content, graphics and presentation were created and uploaded into GitHub repository in January 2021. Following, the event was uploaded on the project website and dissemination could start.

As Zbigniew highlighted, the webinar was held in virtual mode in English, and its purpose was dedicated to the use of remote sensing data in the management of urban greenery. Target group and learning outcomes were also listed (Figure 10), as well as agenda (Figure 11).

Figure 10 Slide with event details from presentation on "EO for urban greenery management" webinar by Zbigniew Szkop

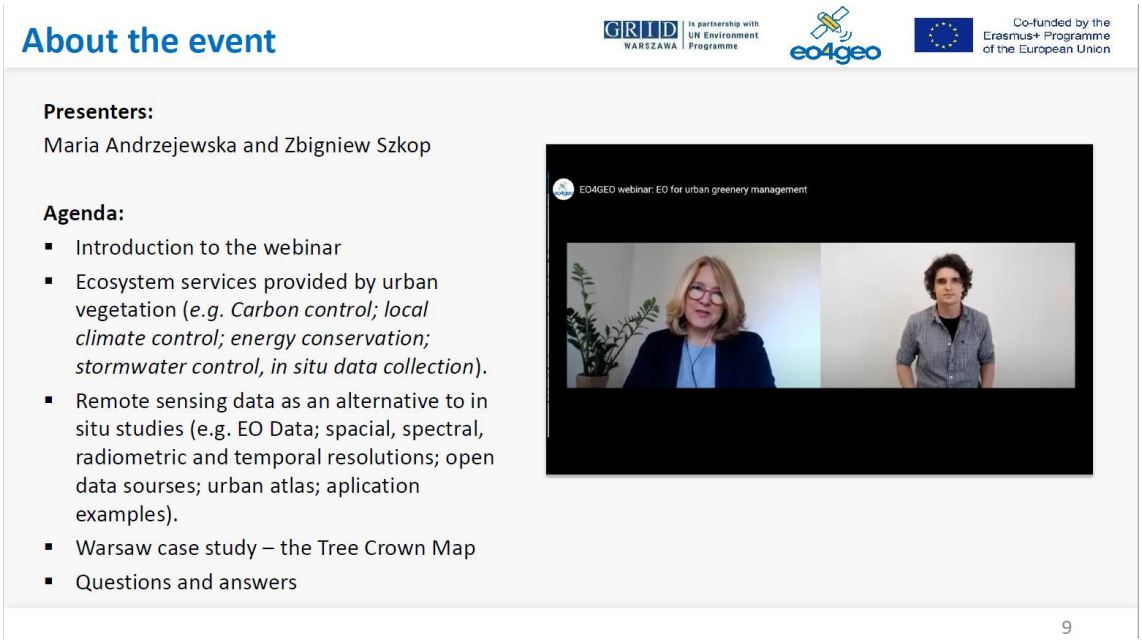

Figure 11 Slide with event agenda from presentation on "EO for urban greenery management" webinar by Zbigniew Szkop

After presenting the event details, Zbigniew moved to the participant's overview: 91 registered, from which 57 participated as unique viewers. Their age was mostly between 25 and 49, with

almost equal gender distribution, mostly represented by employees from small and medium enterprises. Almost all of of the participants were from Europe, with Italy leading.

Closing his presentation, Zbigniew highlighted the event's outcomes and evaluation, in which the webinar got an average of 4.6/5 points from evaluation questionnaires. The participants evaluated the usefulness of the TA for their work/future career or studies at the level of 4.3/5, and the acquired knowledge as 4.6/5, which can be assessed as a high and satisfactory result. 100% of participants would recommend a next EO4GEO training action to a friend.

3.3. Evaluation of the Training Actions

After the presentations on selected training actions, Krzysztof Zych (UNEP/GRID-Warsaw Centre) shared the current results of training actions evaluations coming from the evaluation questionnaires. He started with a short overview of the evaluation methodology, and then went to presenting an average score from each question for subsectors: integrated application (Figure 12), smart cities (Figure 13), climate change (Figure 14) and summer schools (Figure 15). He also listed – for each subsector – areas that could be a focus point while preparing and conducting future training actions, due to evaluation score slightly below average, although still in a satisfactory range (value approximately 4/5).

On average, participants expressed their satisfaction with the training actions as 4.5/5. When assessing the results of an evaluation, it should also be noted that evaluation questionnaires are usually filled out by less satisfied participants, since usually a contented person has less need to fill out an evaluation questionnaire after an event. All the more, the result of the evaluation of the TAs being around 4.3/5 as an average answer from all of the questions and 4.8/5 average satisfaction is highly satisfactory.

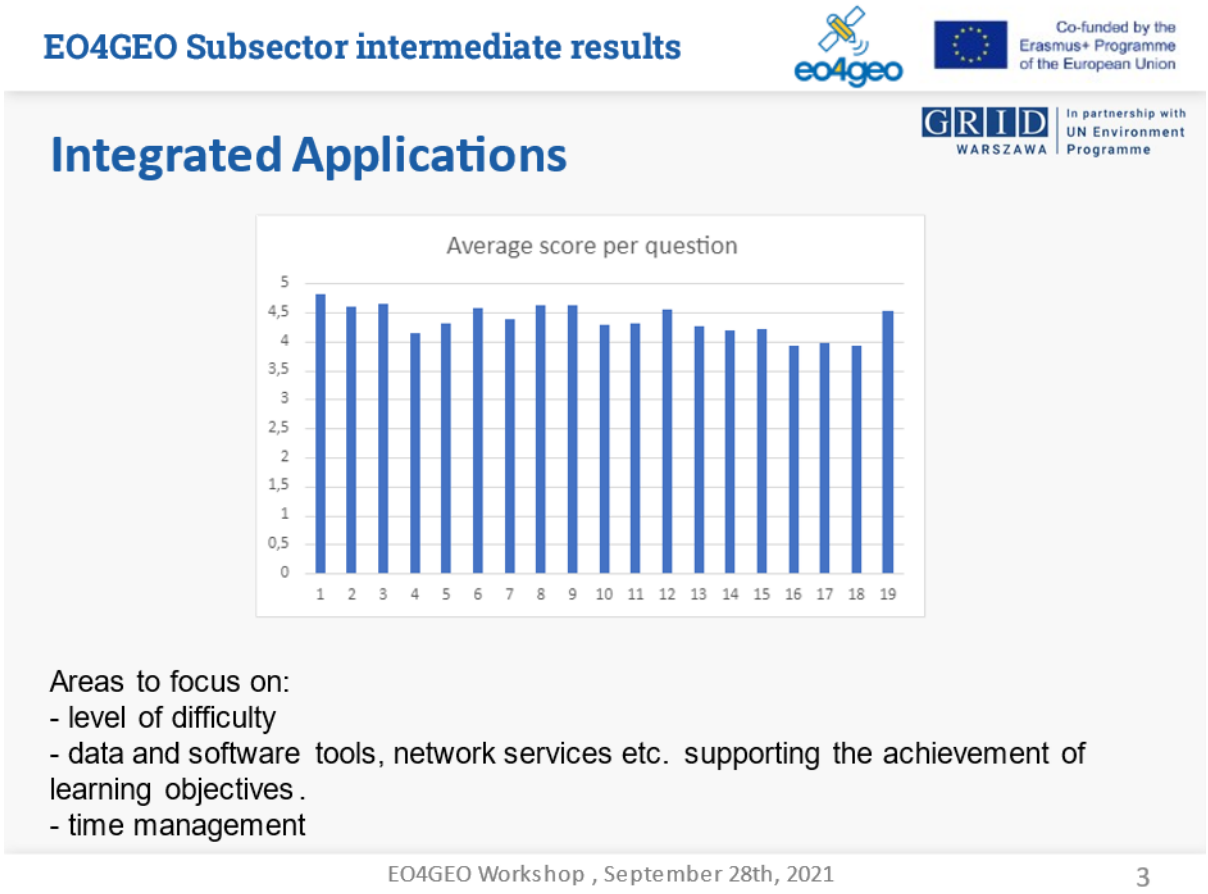

Figure 12 Slide with integrated application subsector evaluation summary from presentation by Krzysztof Zych

The chart presented in Figure 12 reflects particular scores for evaluation results coming from the Training Actions evaluation questionnaires in the subsector "Integrated applications". Krzysztof Zych described the results of selected questions during his presentation. An average answer from the evaluation in this subsector was 4.4/5, while average satisfaction with the training action was rated 4.5/5 (question 19). The participants rated high on organizational aspects and the structure of the TA (question 1-2 and 8-9), the possibility to interact with trainers and other participants (question 3), case studies (question 6). They also agree that the TA raised their interest in the topic (question 12).

At the bottom of the slide are listed areas that could be a focus point while preparing and conducting future training actions, due to evaluation score slightly below average, although still in a satisfactory range (value approximately 4/5), like level of difficulty (too low or too high), usefulness of chosen data and tools for achieving learning objectives and adequate amount of time to complete the task (which can be linked with difficulty level, if some of the participants did not have a high enough skills before entering the TA).

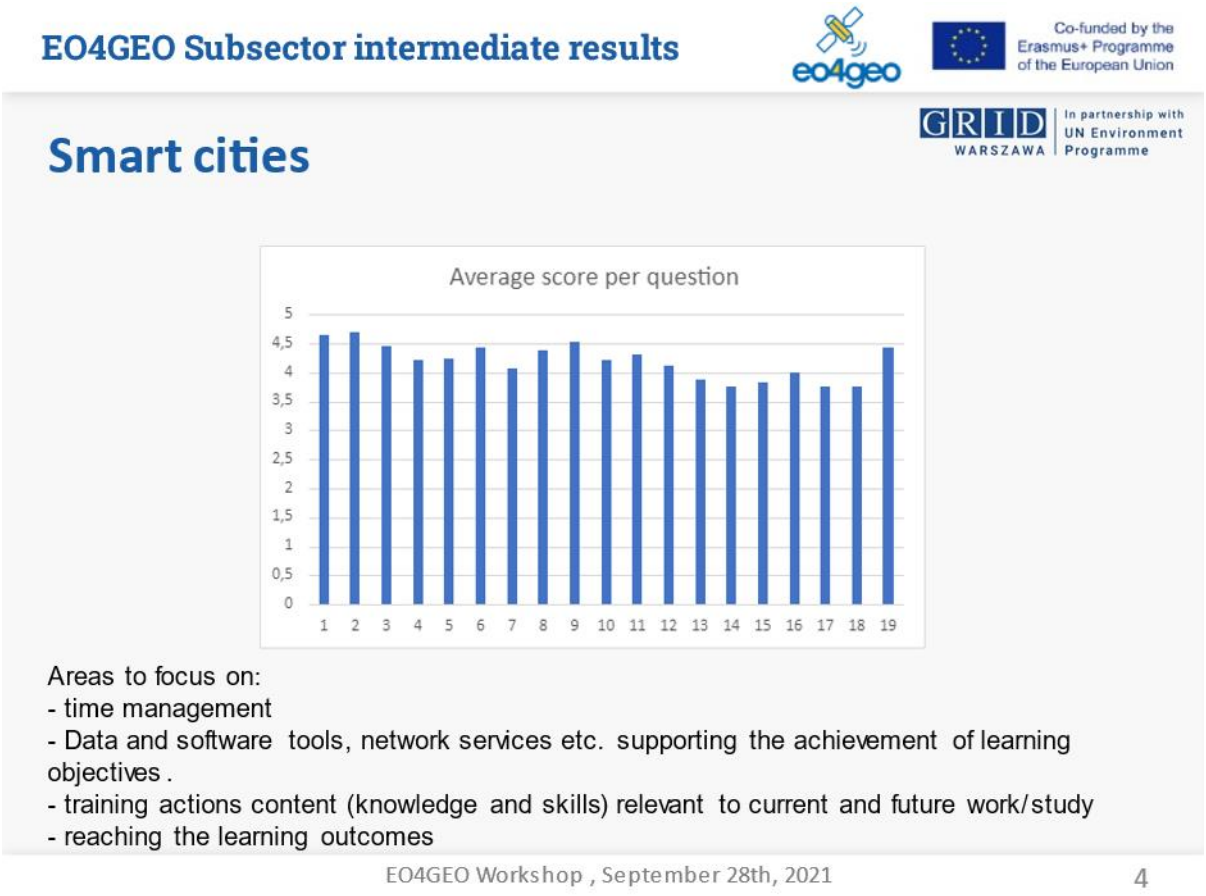

Figure 13 Slide with smart cities subsector evaluation summary from presentation by Krzysztof Zych

The chart presented in Figure 13 reflects particular scores for evaluation results coming from the Training Actions evaluation questionnaires in the subsector "Smart cities". Krzysztof Zych described the results of selected questions during his presentation. An average answer from the evaluation in this subsector was 4.2/5, while average satisfaction with the training action was rated 4.4/5 (question 19). The participants rated the organizational aspects high (first two questions), as well as the use of case studies (question 6) and the schedule (question 9).

At the bottom of the slide are listed areas that could be a focus point while preparing and conducting future training actions, due to evaluation score slightly below average, although still in a satisfactory range (value slightly less than 4/5), like usefulness of chosen data and tools for achieving learning objectives, an adequate amount of time to complete the task, relevance of the TA content to current and future work or study and the reached learning outcome. These topics correspond to the challenging but also very individual needs of each participant and were therefore

taken into special consideration during the development of the Training Actions. Despite the evaluation value slightly below an average, this is still a satisfactory result.

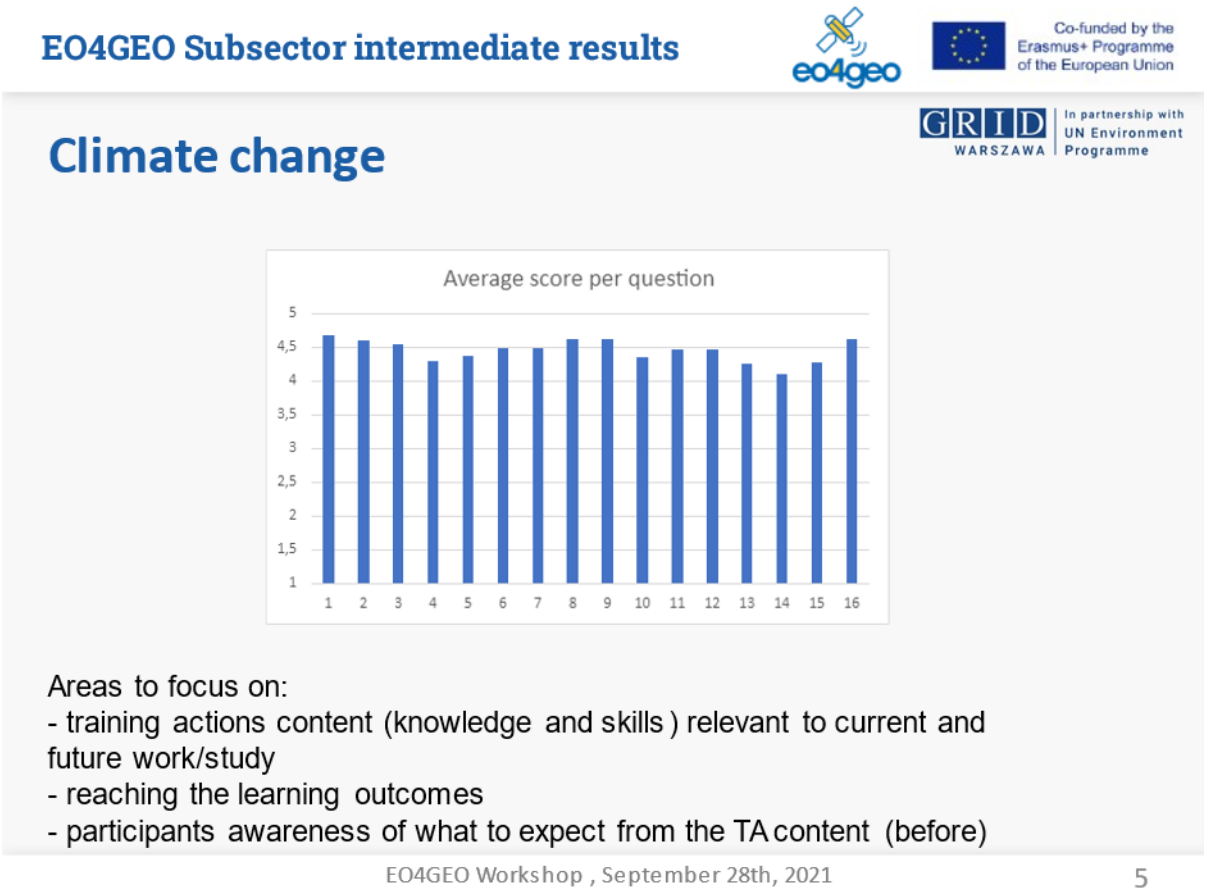

Figure 14 Slide with climate change subsector evaluation summary from presentation by Krzysztof Zych

The chart presented on the Figure 14 reflects particular scores for evaluation results coming from the Training Actions evaluation questionnaires in the subsector "Climate change". Krzysztof Zych described the results of selected questions during his presentation. An average answer from the evaluation in this subsector was 4.4/5, while average satisfaction with the training action was rated 4.6/5 (question 16). The participants rated high on organizational aspects and the structure of the TA (question 1-2 and 8-9) and the possibility to interact with trainers and other participants (question 3).

At the bottom of the slide are listed areas that could be a focus point while preparing and conducting future training actions, due to evaluation score slightly below average, although still in a satisfactory range (value approximately 4/5), like relevance of the TA content to current and future work or study and reached learning outcome. As stated in case of Smart Cities subsector, these topics correspond to the challenging but also very individual needs of each participant, which was

taken into special consideration during the development of the Training Action. Despite the evaluation value slightly below an average, this is still a satisfactory result.

What was also rated in the evaluation of this subsector slightly below the average was the participants awareness of what to expect from the TA. Since this is not a recurring problem in other sectors and all training courses were promoted with a similar methodology, this aspect does not seem to be an organizational issue. It could be, for example, caused by individual participants who expected to get access to all materials before the training.

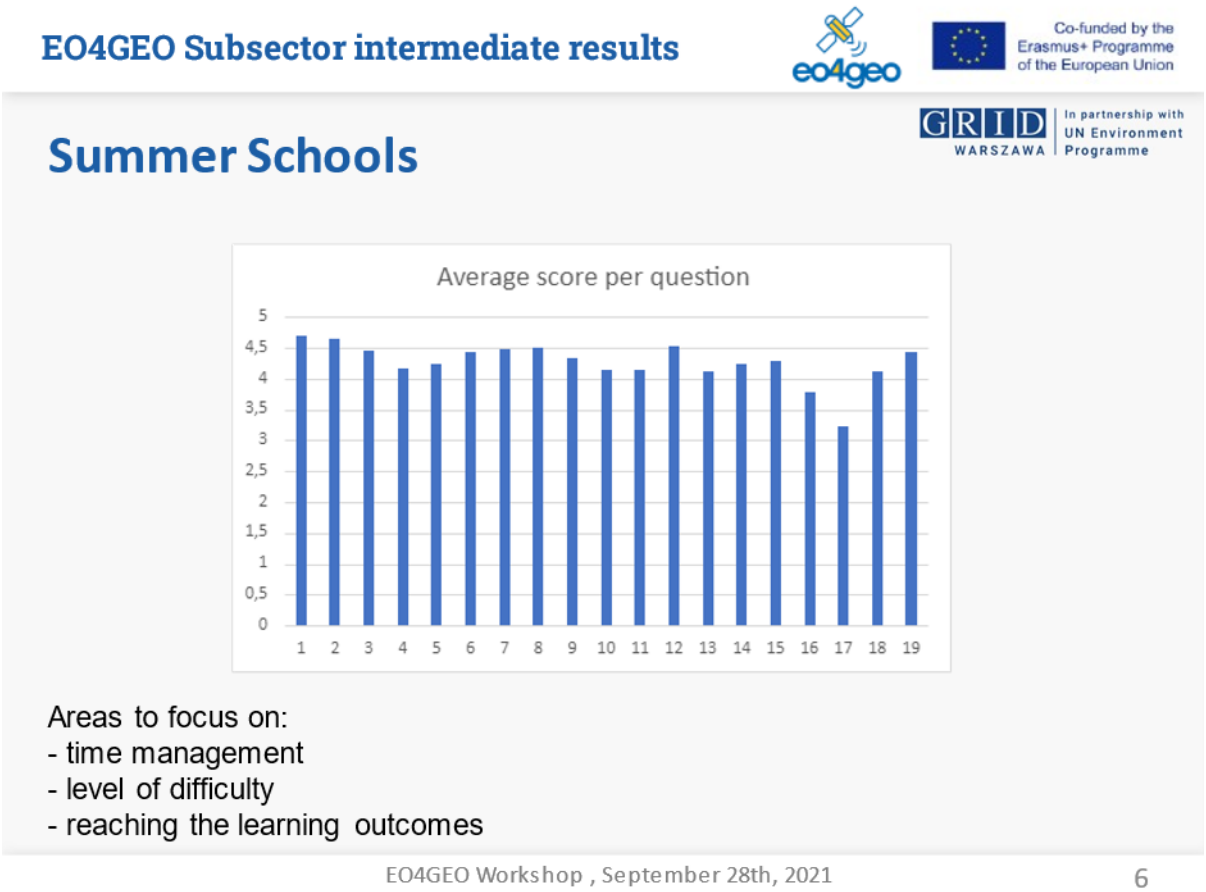

Figure 15 Slide with summer school subsector evaluation summary from presentation by Krzysztof Zych

The chart presented on the Figure 15 reflects particular scores for evaluation results coming from the Training Actions evaluation questionnaires in the subsector "Summer schools". Krzysztof Zych described the results of selected questions during his presentation. An average answer from the evaluation in this subsector was 4.3/5, while average satisfaction with the training action was rated 4.4/5 (question 19). The participants rated the organizational aspects and the structure of the TA high (questions 1, 2 and 8), usefulness of provided training material (question 7). They also agree that the TA raised their interest in the topic (question 12).

At the bottom of the slide are listed areas that could be a focus point while preparing and conducting future training actions, due to evaluation score slightly below average, although still in a satisfactory range (value approximately 4/5), like level of difficulty (too low or too high), reaching the learning objectives and adequate amount of time to complete the task. The last two issues can be linked with the difficulty level, if some of the participants did not have a high enough skill level before entering the TA.

3.4. Breakout session

The last part of the event was a breakout session on lessons learned with final discussion. The participants were divided into two separate breakout rooms on the zoom platform, in which they could talk and share their ideas freely. There were two moderators in each room: Zofia Pawlak (UNEP/GRID – Warsaw Centre) with Krzysztof Zych (UNEP/GRID – Warsaw Centre) in room 1, and Kristyna Mechurova (Spatial Services) with Markus Kerschbaumer (Spatial Services) in room 2.

Each group had two (one mandatory and one extra, if there was enough time) questions based on low-evaluated aspects from the evaluation questions, and their task was to provide measures and recommendations to improve future events. Participants worked simultaneously on a common, interactive whiteboard from Miro, discussing in Zoom's breakout rooms and putting their ideas on colourful notes on the board (Figure 16).

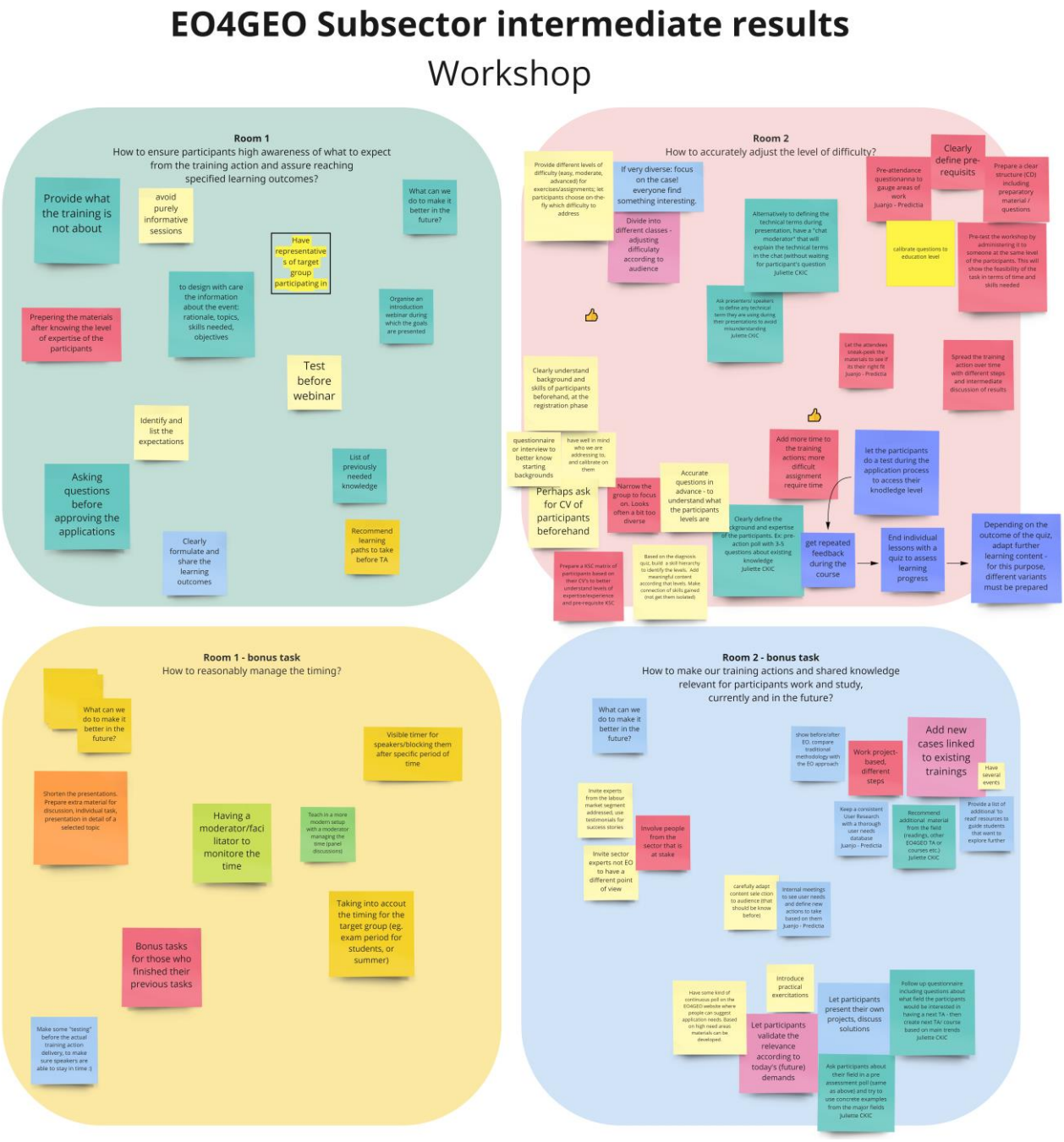

Figure 16 Interactive whiteboard from Miro with ideas developed during breakout session

Each group took a different approach to present the task. First group focused on discussions to determine solutions to write on the board, while second developed ideas directly on the board and connected them into topic-related subgroups.

First's group basic topic was "How to ensure participants high awareness of what to expect from the training action and assure reaching specified learning outcomes?", and an extra question was "How to reasonably manage the timing?". Second group had following tasks: "How to accurately

adjust the level of difficulty?" and "How to make our training actions and shared knowledge relevant for participants work and study, currently and in the future?".

Key messages that were drawn up during the workshop are described in **chapter 4**, whereas detailed notes from Miro whiteboard can be found in **appendix 7.2**.

3.5. Q&A Session

The Q&A session covered the final part of the event. The first question was asked by one of the event's moderators - Markus Kerschbaumer from Spatial Services. He asked if any of the participants learned something from the already performed TA under EO4GEO, and if there is something to give for TA in the future – ideas or advises.

The first comment on this topic was made by one of the participants, and he started by sharing his story of participating in EO4GEO project. He pointed out how impressed he was with the quality of the presented material, but that he didn't saw a connection between it, the project itself and the BoK. He shared his opinion on how the connection should be made more clear for people who are not familiar with the project.

Next, another participant spoke up, agreeing that the link should be more obvious. He had a question for those involved so far in TA, as he saw a lot of webinars among the conducted TA. He highlighted that webinars are good for introducing a topic at a base level, focusing on knowledge transfer and not on skill transfer, at that it's a probably a reason for the difficulties regarding intensity and training level. He thinks that to get skills and good insights you need some time and several events linked together, so participants can deepen their knowledge in between them and have time to test and process it. Enough time and individual learning paths are important for transfer of skills, and this format should be chosen more in the future, like in the conducted summer schools.

The last feedback and comments during Q&A session were from one of the speakers Valerio Tramutoli from UNIBAS, and he pointed out that there are different types of people interested in participating in TA. He shared his opinion that if the event organizer knows the audience expectations, and they share a common professional interest, you can show them a specific topic to make the TA much more interesting. He highlighted the importance of focusing on participants background and interests, to offer them a good course and training experience.

4. Results: main messages

The main ideas that emerged during breakout session can be split into three categories: training's action (TA) content preparations, registration process and execution of TA. They are listed as recommendations for the future TA below.

Preparing training action content

- If possible, choose workshops, summer schools or academic courses instead of webinars, to ensure effective skill transfer. Of course, this recommendation can only be applied after the pandemic is over, as often it was safer to choose webinars during this time.
- The target group for the TA should be carefully selected before choosing the exact material - best to have a representative participating in course development, to meet the needs. Adjust TA's timing for chosen target group.
- Involve experts from the sector that is at stake, to ensure that shared knowledge is relevant for participants work and study.
- Provide detailed information with clearly defined learning outcomes and needed knowledge before registration, so every potential participant can have an idea not only what the TA will be about, but also what won't be learned (or provide a little sneak-peak to the material at registration time).

Registration process

- Test potential participant before accepting their application, or ask them for their CVs, to have an understanding of the level of experience with presented topic, as well Identify and list the expectations. If needed, split participants into different levels of difficulty and have more events under one TA.
- Recommend learning paths to take before TA.

During training action

- Make sure to have enough time for discussion and interactions between participants - cut the presentations if needed.
- In case of variation in the level of knowledge, have someone explaining technicalities in a chat box, or make sure that the speakers will define them during their presentation.

- Get repeated feedback during the course and end individual lessons with a quiz to assess the learning progress.

5. Workshop evaluation

The workshop was attended by partners and interested parties from over a dozen countries, mostly from Italy (25%), followed by Croatia 13%. Gender balance was exactly 50-50, out of 24 respondents 12 were man and 12 were woman. The dominant age range was between 50-64 (13 respondents), followed by ranges of 25-34 and 35-49 (5 respondents each). The most numerous groups among the respondents were teachers/trainers from Universities (9) and SME employees (7). We have received no responses from students.

As a result of the evaluation of Subsector Intermediate results workshop, we can conclude that the most important motivation to participate in the workshop was to find out more about the EO4GEO project, discuss the so far results, but also to be up-to date. Organisation of the webinar, tools and software used as well as the possibility to exchange ideas and interact were all marked high, between 4.38 and 4.79 out of 5. Among the recommendations submitted, the main regarded the discussion and Q&A part, with suggestions to increase the time provided for discussion with the speakers and among participants.

Pre-awareness of the workshop content, workshop structure, schedule and timing, relevance of topics covered and clarity of the presentations were all marked high - in the score between 4.3 and 4.5. However, rating of the knowledge and skills acquired during the event was slightly below 4 - namely 3.9. The same value follows when it comes to the importance of the knowledge acquired for the participants studies or work. However, it should be taken into account that the event was evaluated with the classic EO4GEO evaluation questionnaire focused on the transfer of knowledge and skills, whereas said workshop focused on the exchange of experience.

We can conclude that in general participants were satisfied with the webinar - the question if the workshop met their expectations rank is 4.3 out of 5, moreover respondents rank their satisfaction with the workshop at 4.4 out of 5.

Nearly a half of the respondents enjoyed Miro Board (45%) the most. Participants also enjoyed the quality and good organization of the workshop. The main conclusion from the recommendations concerning this part is to give more time for discussion/Miro Board in the future. 23 out of 24 participants would recommend EO4GEO trainings to their colleagues.

The evaluation questionnaire by which the evaluation data have been collected can be found in **appendix 7.3**.

6. Conclusions

Thanks to the "EO4GEO Subsector intermediate results" workshop partners of the consortium could see an overview of Training Actions implemented so far and their feedback, to be up-to-date with project's progress. They could also view the challenges that have been faced by TA's organizers as well as provide their point of view on ways to improve future TAs and discuss ongoing results.

Main focus points regarding designing and organising TA that were evaluated by participants slightly below average were mainly concerning level of difficulty (too low or too high), reaching the learning outcomes and relevance of the TA's content to current and future work/study. These topics correspond to the challenging but also very individual needs of each participant and were therefore taken into special consideration during the development of the Training Actions. Moreover, participants have expressed their satisfaction with the training actions as 4,5 out of 5.

In the groupwork part of the event the participants developed suggestions and methods for improving future TAs and overcoming potential challenges. Different perspectives could be confronted with each other during group discussions. Since almost all consortium partners were represented, it was possible to gain a broad view of these issues.

The main challenge that emerged during presentations and discussion regarded the form of the TA, mainly questionable ability to achieve effective skill transfer in webinars. As it was pointed, webinars are a great way to transfer knowledge, especially at basic level, but the skill transfer requires time and multiple events to ensure its effectiveness. Therefore, TA's in the form of summer schools should be chosen more often in the future, to guarantee enough time and individual learning paths for the participants.

Another vulnerable area focused on ensuring that the prepared material would match the skill level and expectations of the participants. The need of repetitive feedback during the TA was also raised, to assess learning progress.

It was also pointed, that the project needs stronger evidence of the connection with developed materials and the BoK for people who are not familiar with the project.

A significant part of the workshop covered the topic of difficulties regarding the remote form of TAs, made necessary by the epidemiological situation in the world. Even if the virtual form worked well for the students, the social component of such activities was noticeably missing. Due to the pandemic, it was difficult to create an environment that could enable and enhance effective skill transfer.

In the lessons learned from the TAs, organizers pointed the importance of giving administration's decision makers as much information about the Copernicus solutions as possible, so they can understand not only possibilities, but also the complexity, limitations and potential, as well as significance of choosing the right topic to meet audience expectations. However, it is important to take into account the fact that participant's expectations could slightly differ from the needs of the labour market that should be anticipated by the capacity building action in this rapidly changing sector.

Ideas and suggestions developed during the event's groupwork and discussion part were a valuable source of information to help defining the Long-term Action Plan (see Chapter 4 and Annex 7.2).

Based on the evaluation of the workshop we can conclude that in general participants were satisfied with the event, as respondents rank their satisfaction with the workshop at 4.42 out of 5

7. Annexes

7.1. Agenda

The EO4GEO Subsector intermediate results workshop was conducted according to the following agenda:

11:00 – 11:15 **Introduction** on EO4GEO and the Training Actions

Zofia Pawlak, *UNEP/GRID – Warsaw Centre*

11:15 – 12:15 **Presentations**

Presenting selected training actions from subsectors - what have we done and achieved so far? What are the outcomes? What lessons have we learned?

Daniela Iasillo, *Planetek Italia*, on "*The rise of Artificial Intelligence for Earth Observation"* webinar (Integrated Applications subsector)

Eva-Maria Missoni-Steinbacher, *Paris Lodron University of Salzburg*, on "*Intelligent Earth Observation*" summer school (Integrated Applications subsector)

Valerio Tramutoli, *University of Basilicata*, on "*Introduction to Satellite Remote Sensing*" summer school (Integrated Applications subsector)

Greger Lindeberg, *Geografiska informationsbyrån,* on "*Identification of local heat islands to support city planning*" and *"Evaluation and planning of urban green structures*" webinars (Smart Cities subsector)

Zbigniew Szkop, *UNEP/GRID – Warsaw Centre*, on "*EO for urban greenery management*" webinar (Climate change subsector)

12:15 – 12:40 **Breakout session** on lessons learned from the previous events, encouraging participants to share their thoughts on improvements for future events

Moderators:

Kristyna Mechurova, *Spatial Services*

Markus Kerschbaumer, *Spatial Services*

Zofia Pawlak, *UNEP/GRID – Warsaw Centre*

Krzysztof Zych, *UNEP/GRID – Warsaw Centre*

12:40 – 12:50 Recommendations for the future training actions

Krzysztof Zych, *UNEP/GRID – Warsaw Centre*

12:50 – 13:00 Q&A Session and summary

7.2. Breakout session notes from Miro whiteboard

Listed suggestions and answers are raw data that emerged during brainstorms at the workshop's breakout session (duplicate ideas were combined). They are summarized in the easier to read form in chapter 4 (*Results: main messages*) of this report.

Room 1

Question 1: How to ensure participants high awareness of what to expect from the training action and assure reaching specified learning outcomes?

- Provide what the training is not about
- Avoid purely informative sessions
- Have representatives of target group participating in course development / design (Like a beta test beforehand)
- Organise an introduction webinar during which the goals are presented
- To design with care the information about the event: rationale, topics, skills needed, objectives
- Preparing the materials after knowing the level of expertise of the participants
- Identify and list the expectations
- Test before webinar
- Asking questions before approving the applications
- List of previously needed knowledge
- Recommend learning paths to take before TA

Question 2: How to reasonably manage the timing?

- Shorten the presentations. Prepare extra material for discussion, individual tasks, presentation in detail of a selected topic
- Teach in a more modern setup with a moderator managing the time (panel discussions)
- Visible timer for speakers/blocking them after specific period of time
- Taking into account the timing for the target group (eg. exam period for students, or summer)
- Bonus tasks for those who finished their previous tasks

- Make some "testing" before the actual training action delivery, to make sure speakers are able to stay in time

Room 2

Question 1: How to accurately adjust the level of difficulty?

- Provide different levels of difficulty (easy, moderate, advanced) for exercises/assignments; let participants choose on-the-fly which difficulty to address (or divide into different classes - adjusting difficulty according to audience)
- If very diverse: focus on the case! Everyone finds something interesting.
- Ask presenters/speakers to define any technical term they are using during their presentations to avoid misunderstanding
- Alternatively, to defining the technical terms during presentation, have a "chat moderator" that will explain the technical terms in the chat (without waiting for participant's question)
- Clearly define pre-requisites
- Prepare a clear structure including preparatory material / questions
- Pre-attendance questioning to gauge areas of work
- Calibrate questions to education level
- Pre-test the workshop by administering it to someone at the same level of the participants. This will show the feasibility of the task in terms of time and skills needed
- Let the attendees sneak-peek the materials to see if it’s their right fit
- Spread the training action over time with different steps and intermediate discussion of results
- Clearly understand background and skills of participants beforehand, at the registration phase (Questionnaire or interview to better know starting backgrounds)
- Have well in mind who we are addressing to, and calibrate on them
- Perhaps ask for CV of participants beforehand

- Narrow the group to focus on. Looks often a bit too diverse
- Accurate questions in advance - to understand what the participants levels are
- Prepare a Knowledge, Skills, Competences (KSC) matrix of participants based on their CV's to better understand levels of expertise/experience and pre-requisite KSC
- Clearly define the background and expertise of the participants. Example: pre-action poll with 3-5 questions about existing knowledge
- Based on the diagnosis quiz, build a skill hierarchy to identify the levels. Add meaningful content according to those levels. Make connection of skills gained (not get them isolated)
- Add more time to the training actions; more difficult assignment require time
- Get repeated feedback during the course. End individual lessons with a quiz to assess learning progress

Question 2: How to make our training actions and shared knowledge relevant for participants work and study, currently and in the future?

- Invite experts from the labour market segment addressed, use testimonials for success stories, involve people from the sector that is at stake
- Invite sector experts not EO to have a different point of view
- Show before/after EO. Compare traditional methodology with the EO approach
- Work project-based, different steps
- Add new cases linked to existing trainings
- Provide a list of additional 'to read' resources to guide students that want to explore further (readings, other EO4GEO TA or courses etc.)
- Have several events
- Carefully adapt content selection to audience
- Internal meetings to see user needs and define new actions to take based on them

- Have some kind of continuous poll on the EO4GEO website where people can suggest application needs. Based on high need areas materials can be developed.
- Let participants validate the relevance according to today's (future) demands
- Introduce practical exercitations
- Let participants present their own projects, discuss solutions
- Ask participants about their field in a pre-assessment poll (same as above) and try to use concrete examples from the major fields
- Follow up questionnaire including questions about what field the participants would be interested in having a next TA - then create next TA/ course based on main trends

7.3. Evaluation questionnaire

Event evaluation was based on following evaluation questionnaire prepared by Krzysztof Zych (UNEP/GRID-Warsaw Centre):

Evaluation of Workshops: EO4GEO Subsector Intermediate Results [UNEP/GRID] Each participant is warmly invited to fill in the following anonymous questionnaire, helping us to better manage and improve the quality of next EO4GEO trainings and to provide useful ideas for project activities.	
Your details	
1. Country	*Enter your answer*
2. Gender	□ Male □ Female □ Diverse □ Prefer not to say
3. Age	□ 15-24 □ 25-34 □ 35-49 □ 50-64 □ Age 65 and older
4. Select the category that better fits with you	□ Student □ Teacher / Trainer at a University/Research Centre/VET provider □ Employee at a Local Body (Region, Province,

	Municipality, ...) □ Employee at a National Body (Civil Protection, ….) □ Employee at a large company □ Employee at a SME □ Self-employed □ Representative of a Professional Association/ Professional □ Other
5. What is your motivation to take part in this training?	*Enter your answer*
Organizational aspects	
From 1 (very poor) to 5 (very good)	
6. Organisation of the workshop on behalf of the organising institution (e.g. registration platform, contact with the organizer, proper communication about training details, ...).	
7. Functionality of conference tool and software used (video, sound, other technical aspects, ...)	
8. Possibility to exchange and interact with moderators, speakers and other participants (forums, sessions for discussion, Q&A, ...)	
9. Do you have any suggestions or recommendations for improvements of organizational aspects?	*Enter your answer*
Training content and structure	
From 1 (strongly disagree) to 5 (strongly agree)	
10. When starting the event, I was well informed about the content of the workshop.	
11. I find the knowledge and skills I received through the workshop to be very useful to me.	
12. In my opinion the structure of the workshop was logical and well organized	

13. The workshop schedule and time frame were very good.	
14. How would you rate the relevance of the covered topics?	
15. How would you rate clarity of the speakers in presenting their contents?	
16. The workshop met my expectations.	
17. What did you most like about the workshop? (e.g. innovative approach, quality of presentations...)	*Enter your answer*
18. What can be improved regarding structure, format and material?	*Enter your answer*
Impact of the workshop	
From 1 (strongly disagree) to 5 (strongly agree)	
19. I think the workshop is very relevant for my current work duties/studies.	
20. The knowledge and skills I received during the workshop are valuable to my work/future career or studies.	
Overall grading of the training action	
From 1 (not satisfied at all) to 5 (very satisfied)	
21. How satisfied are you with the workshops?	
22. Have you recognized differences as compared to other trainings?	□ Yes □ No